

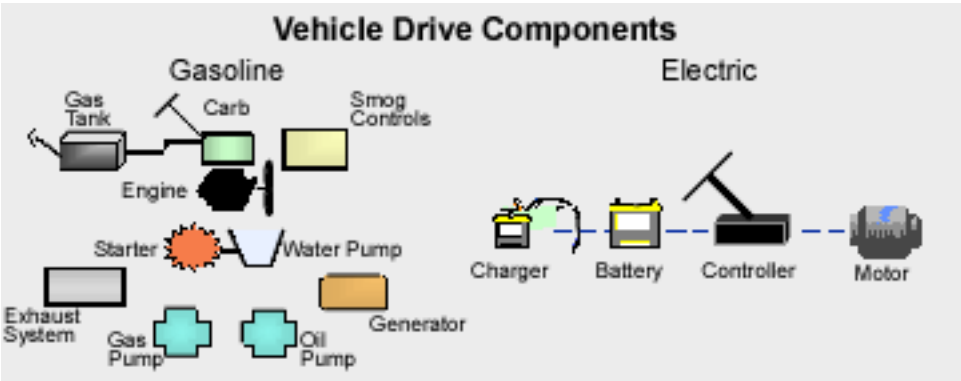
# How Do Gasoline & Electric Vehicles Compare?

From the outside, the electric vehicle looks like a gasoline-powered vehicle with the exception that the electric vehicle does not have a tail pipe. Internally, it is quite a different story. According to CALSTART, the advanced transportation consortium in California, 70% of an electric

vehicle’s component parts may be different from a gasoline-powered vehicle. The electric vehicle has several unique components that serve the same function as the more common components in a gasoline-powered vehicle.

Another significant difference between electric vehicles and gasoline-powered vehicles is the number of moving parts. The electric vehicle has one moving part, the motor, whereas the gasoline-powered vehicle has hundreds of moving parts. Fewer moving parts in the electric vehicle leads to another important difference. The electric vehicle requires less periodic maintenance and is more reliable. The gasoline-powered vehicle requires a wide range of maintenance, from frequent oil changes, filter replacements, periodic tune ups, and exhaust system repairs, to the less frequent component replacement, such as the water pump, fuel pump, alternator, etc.

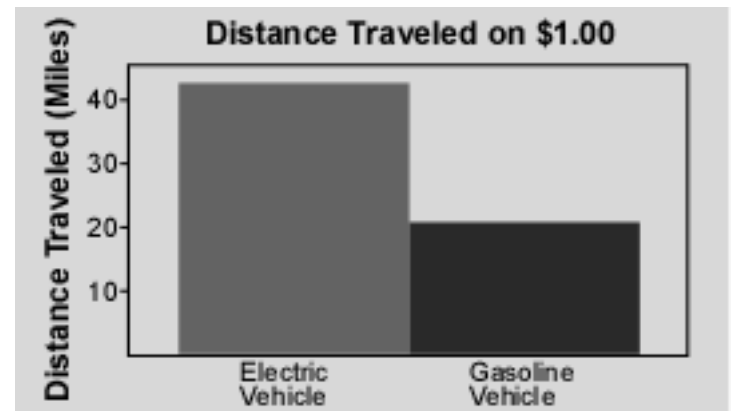
The electric vehicle’s maintenance requirements are fewer and therefore the maintenance costs are lower. The electric motor has one moving part, the shaft, which is very reliable and requires little or no maintenance. The controller and charger are electronic devices with no moving parts, and they require little or no maintenance. State-of-the-art lead acid batteries used in current electric vehicles are sealed and are maintenance free. However, the life of these batteries are limited and will require periodic replacement. New batteries are being developed that will not only extend the range of electric vehicles, but will also extend the life of the battery pack which may eliminate the need to replace the battery pack during the life of the vehicle.



GASOLINE VEHICLE	FUNCTION	ELECTRIC VEHICLE
Gasoline Tank	Stores the energy to run the vehicle	Battery
Gasoline Pump	Replaces the energy to run the vehicle	Charger
Gasoline Engine	Provides the force to move the vehicle	Electric Motor
Carburetor	Controls Acceleration and speed	Controller
Alternator	Provides Power to accessories	DC/DC converter

	Converts DC to AC to power AC motor	DC/AC converter
Smog Controls	Lowens the toxicity of exhaust gases	

Not only are electric vehicles easier and cheaper to maintain, they are also more efficient than the gasoline engine and are therefore cheaper to operate. Based on an electric vehicle efficiency of 3 miles/kwhr and the cost of electricity at 7" per kwhr, the electric vehicle will travel about 43 miles for \$1.00. Based on an average of 22 mpg for gasoline vehicles and a gasoline cost of \$1.25/gal, the gasoline-powered vehicle will go about 18 miles. Thus, the distance that can be traveled for a fuel cost of \$1.00 is more than twice as far with an electric vehicle.



While the electric vehicle will be cheaper to operate and maintain, a number of challenges still exist for the owner of an electric vehicle.

First and foremost is the limited range available with current battery technologies. The driving range between recharging using existing batteries is between 50 to 150 miles. New battery systems are being developed that will increase this range, and prototypes of these batteries have demonstrated ranges up to 200 miles between recharging.

Another challenge facing the owners of electric vehicles is the availability of skilled service technicians to service and maintain the electric vehicle. Training programs are being developed and offered to upgrade the conventional automotive technician with the skills needed to maintain an electric vehicle, and a two-year associate degree program has been developed to train high school graduates to become skilled electric vehicle technicians.

Also needed is the infrastructure to recharge the batteries. The most significant element of the recharging infrastructure already exists: electric power is available in almost all locations. The remaining element needed is to ensure that charging stations, with the proper types of service (i.e., maximum voltage and current), are available at strategic locations to support the electric vehicle. Arrangements must also be made to ensure off-peak charging to get the lowest utility rates.